EFFECTS OF KEATING CHANNEL DREDGE SPOIL DISPOSAL AND LANDFILLING AT THE HEADLAND ON THE WATER QUALITY IN THE TORONTO WATERFRONT

May 15 - August 15, 1980

Ministry
of the
Environment

Ontario

The Honourable
Harry C. Parrott, D.D.S.,
Minister

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Deputy Minister

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MINISTRY OF THE ENVIRONMENT
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OFFICE

Prepared by: M. Griffiths
Great Lakes Surveys Unit
Planning and Co-ordination Section
Water Resources Branch
November, 1980

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SUMMARY

The data collected in the summer of 1980 (May 15-August 15) and discussed in this report suggest that the dredge disposal and landfill construction activities at the Eastern Headland have not adversely affected water quality in the area. Turbidity plumes recorded east of the headland appear to originate from active landfill activity and erosion processes acting on the existing landform. The observed turbidity levels did not, however, reach levels of concern to either the Island or R. C. Harris drinking water supplies or to aquatic life.

Effluent discharges from the Main sewage treatment plant are responsible for elevated nutrient levels in the nearshore waters east of the headland. There is, however, no evidence that these discharges are adversely affecting the water supplies.

Based on the results of the initial period of monitoring, a revised water quality surveillance program will be continued to monitor the headland related activities.

INTRODUCTION

This report is intended primarily as a water quality data publication, presenting information generated through a monitoring program carried out in the Toronto area between May 15 to August 15, 1980 by the Great Lakes Surveys Unit of the Ministry of the Environment. This program was developed to study the Toronto area, with special emphasis placed on the Keating Channel dredge disposal area and consideration given to the nearby municipal water treatment plants. The dredging of the Keating Channel took place between 20 May and 20 June, 1980.

DESCRIPTION OF STUDY AREA

The location of sampling stations is presented on Map 1. The area of the Toronto Waterfront investigated under this study includes the Inner Harbour (Station 1364), the Outer Harbour (Station 202), a 500 m wide strip off the Eastern Headland, and areas in the vicinity of the Toronto Main Sewage Treatment Plant (STP) outfall (Station 1419), and the Island Filtration Plant (1536) and R. C. Harris Filtration Plant (Station 1872) intakes.

The Toronto Inner Harbour receives input from the Don River and a number of storm and combined overflow sewers. The only known direct input into the Toronto Outer Harbour is the Hearn Generating Station cooling water discharge. Water exchange between the Inner Harbour and Lake Ontario takes place through two gaps, with net incoming flow arriving through the west gap and outgoing flow departing through the east gap. The area southeast of the headland is influenced by the Toronto Main STP discharge.

SURVEY OUTLINE

A detailed survey outline entitled, "Toronto Waterfront Program, May 15 - August, 1980, Project 57" is presented in Appendix C. This program, although somewhat revised, will continue until the fall of 1980.

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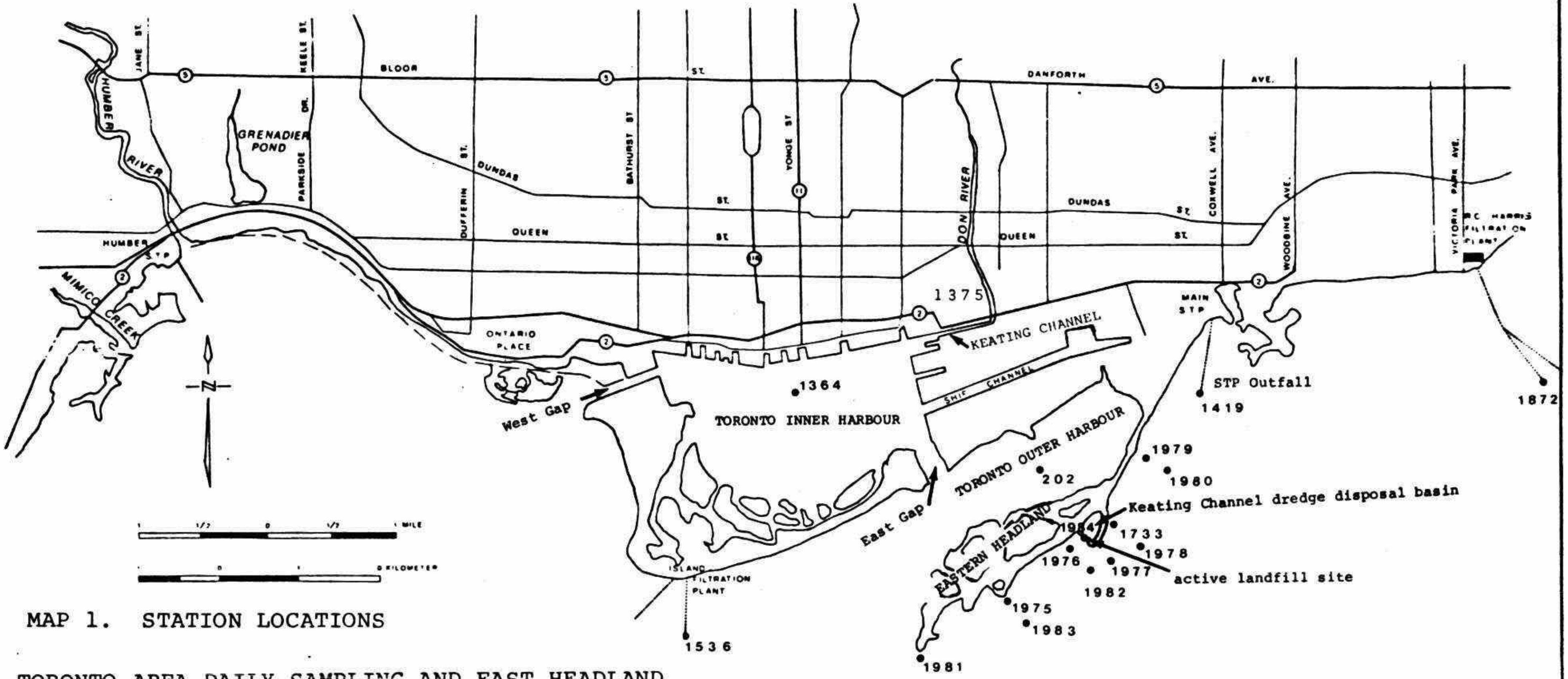


MAP 1. STATION LOCATIONS

TORONTO AREA DAILY SAMPLING AND EAST HEADLAND
LAKEFILL/DREDGE SPOIL DISPOSAL STUDIES
PROJECT 57 - MAY 15 - AUG. 15

RESULTS

Water quality data generated by this program are summarized in tables 1-22. The water monitoring results obtained from the Toronto harbours and the Eastern Headland area are presented in figures 1-10, (Appendix A). The water quality results from raw and finished water at the R. C. Harris and Island Filtration plants can be found in figures 11-22 (Appendix B).

A brief discussion of the key findings provided by this program is presented below:

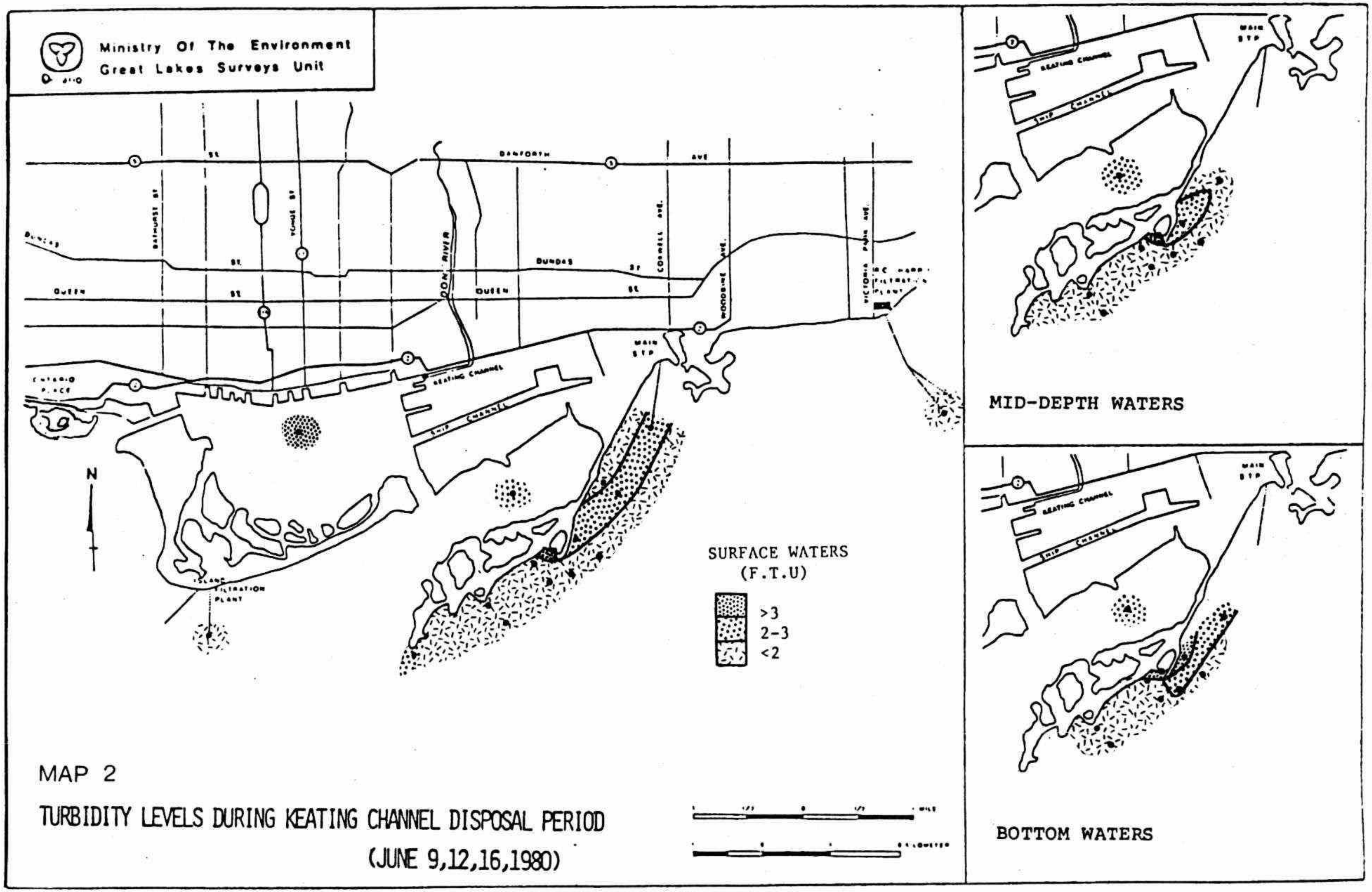
Turbidity

In order to visually depict the extent and magnitude of turbidity plumes detectable east of the headland, average concentration isopleths have been plotted (Maps 2-4) for the following periods:

(i) June 9-16 (dredge disposal period)
(ii) June 30 (post dredge disposal); the June 30 event was treated separately as it represents an unusual occurrence influenced by a preceeding storm event.
(iii) July 3-August 8 (post dredge disposal period)

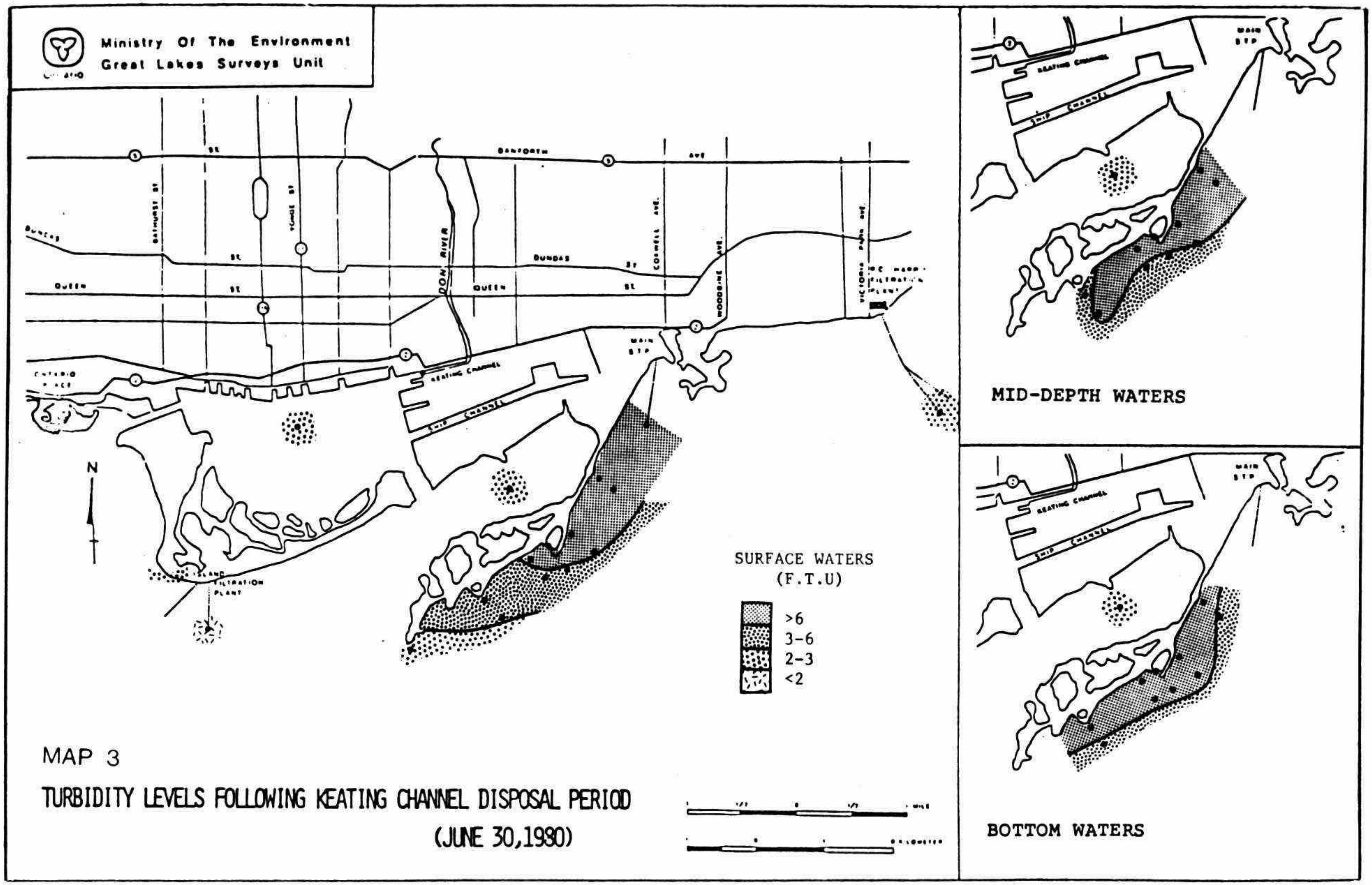
The turbidity plumes recorded east of the headland appear to originate from active landfilling activity. It is important to point out, however, that they do not characterize any other parameter sampled (with the possible exception of suspended solids). This observation is important since it suggests that the headland-related activities are responsible primarily for localized increases in turbidity and are not a major source of nutrients or associated inputs.

As shown in Maps 2-4, the areal extent of the observed turbidity plumes is localized and the turbidity levels within the plumes low, rarely exceeding an acceptable limit for cold water lakes.



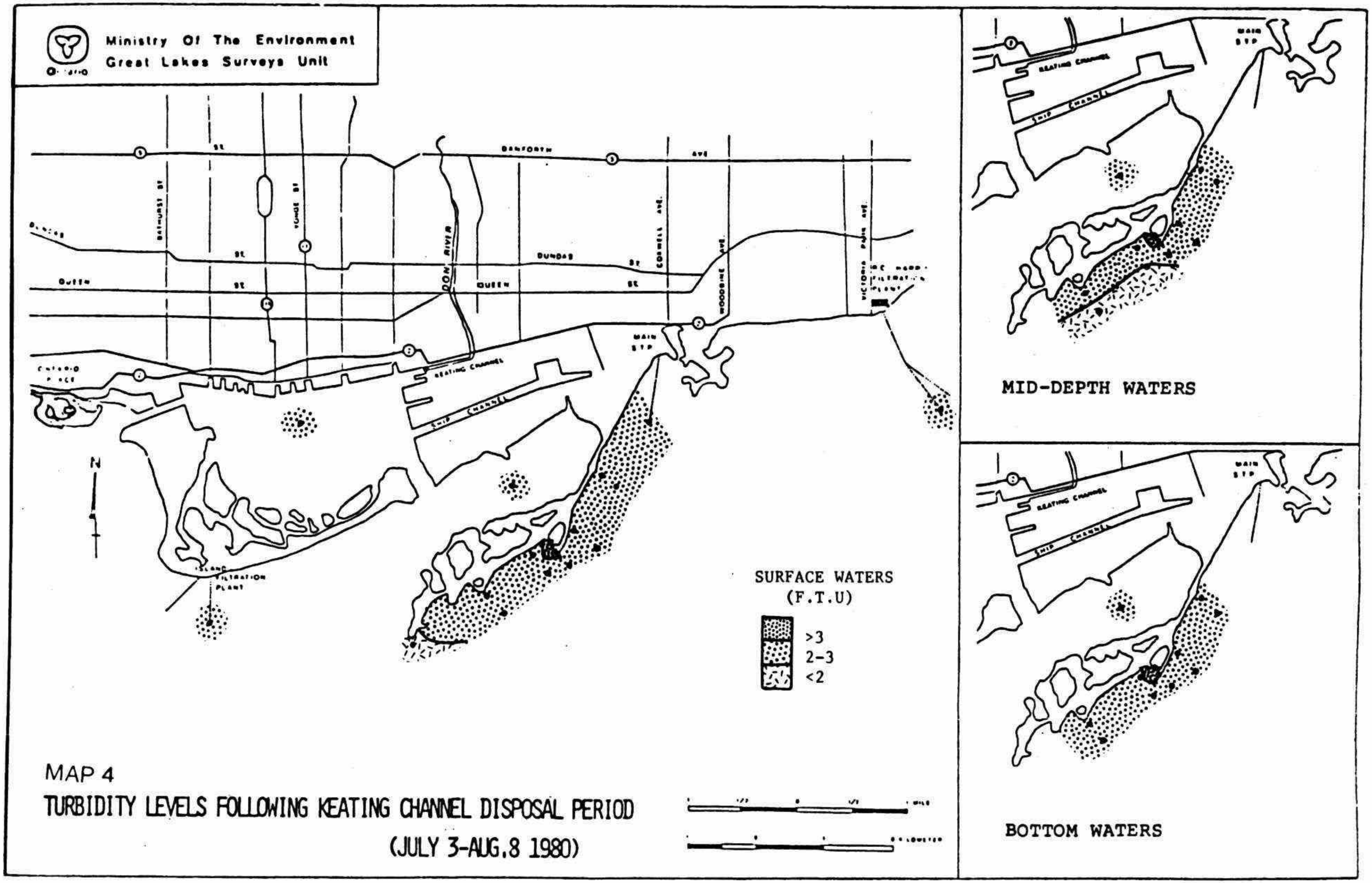
MAP 2

TURBIDITY LEVELS DURING KEATING CHANNEL DISPOSAL PERIOD
(JUNE 9,12,16,1980)



MAP 3

TURBIDITY LEVELS FOLLOWING KEATING CHANNEL DISPOSAL PERIOD (JUNE 30,1980)



MAP 4
TURBIDITY LEVELS FOLLOWING KEATING CHANNEL DISPOSAL PERIOD
(JULY 3-AUG.8 1980)

A comparison of turbidity plumes generated during the Keating Channel dredge disposal period with those from the period that followed, suggests that the dredge disposal operation has little or no effect on the nearby waters. In fact, the turbidity levels near the disposal site were lower during the disposal period than after it. It must be pointed out, however, that it is virtually impossible to separate the contributions of turbidity arising from the various sources in the area which, listed in order of importance, are believed to consist of the following: loss of material from landfill construction, erosion of the existing headland structure, littoral drift from Scarborough bluffs, the effluent from the Toronto Main STP and loss of material from dredge disposal embayment.

The loss of material from the dredge disposal embayment is believed to be minimal due to the combination of a narrow gap opening (65 m), presence of a sill in the gap, quiescent nature of the embayment (promoting settling) and considerable distance (500 m) between the northern end of the embayment where dredgate material is deposited and the gap opening.

Phosphorus

The phosphorus plume configurations observed east of the Headland (Maps 5-7) are similar to, although more extensive than, those recorded for other nutrients and associated parameters. The major source of phosphorus in the area is the Toronto Main STP effluent which has been found to travel in a predominantly southwest direction toward and beyond the dredge disposal/active landfill sites. Although a small nutrient contribution is possible from the landfill site (notably ammonia), its effect on the area is minimal since the nutrient regime east of the headland is mainly determined by the Toronto Main STP discharge.

Other Parameters

The suspended solids parameter was the only one exhibiting any correlation with turbidity. Most other parameters resembled total phosphorus in their distribution. The Toronto Main STP was shown (Appendix A) to be a major source of total phosphorus, filtered

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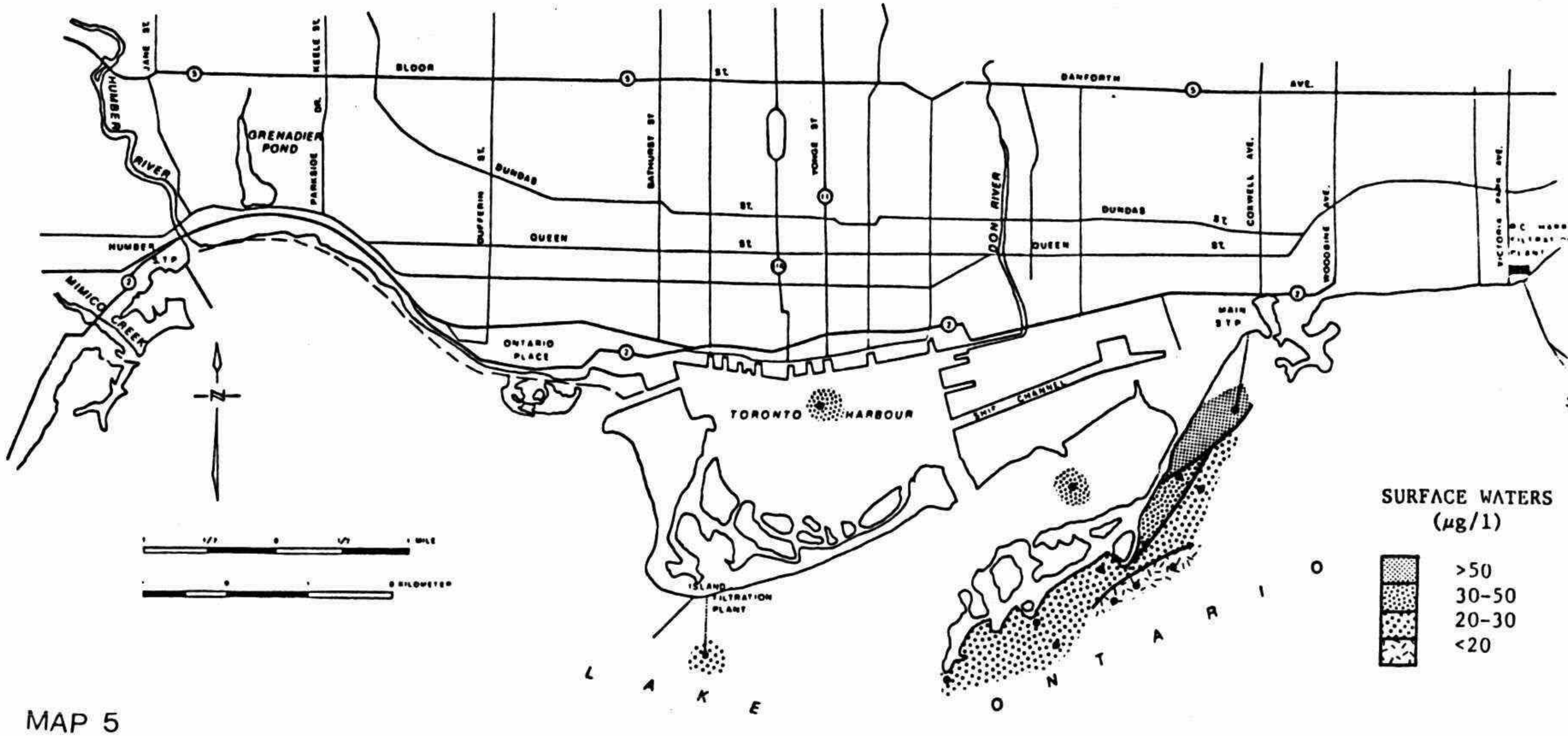
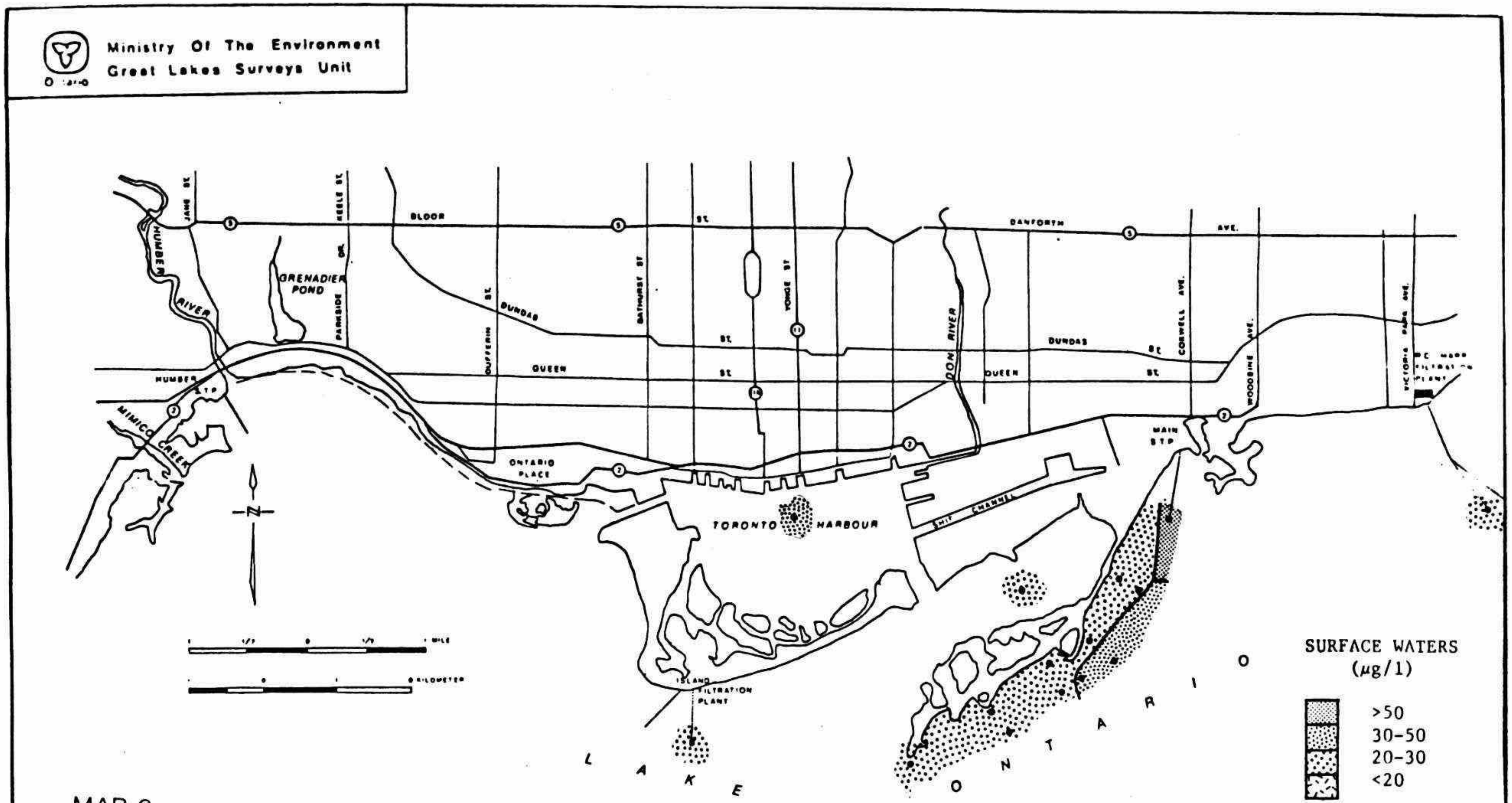


MAP 5

TOTAL PHOSPHORUS LEVELS DURING KEATING CHANNEL DISPOSAL PERIOD (JUNE 9,12,16,1980)



MAP 6

TOTAL PHOSPHORUS LEVELS FOLLOWING KEATING CHANNEL DISPOSAL PERIOD (JUNE 30,1980)

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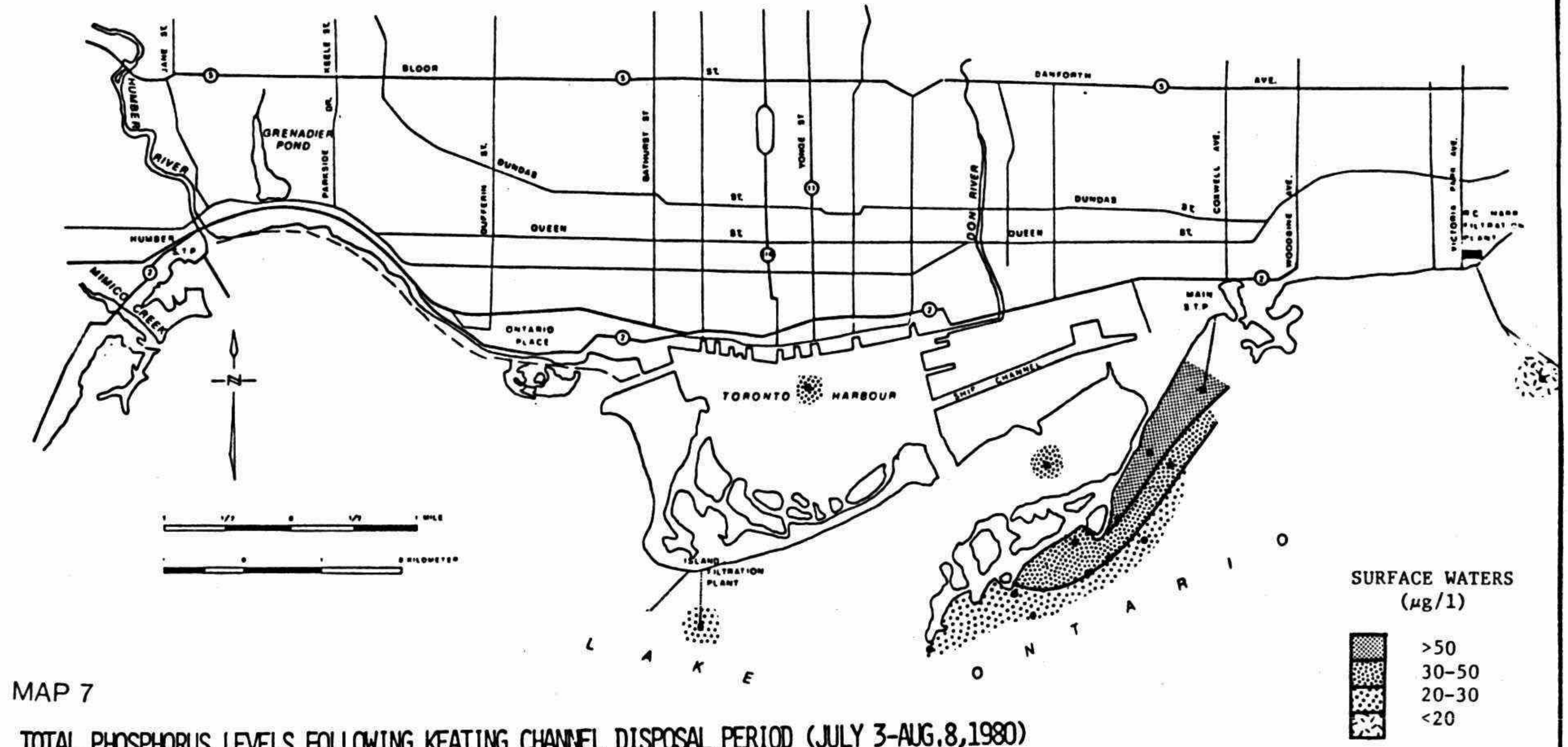

MAP 7

TOTAL PHOSPHORUS LEVELS FOLLOWING KEATING CHANNEL DISPOSAL PERIOD (JULY 3-AUG.8,1980) reactive phosphorus, ammonia, nitrate, nitrite, total Kjeldahl nitrogen and conductivity. A small secondary source of ammonia appears to be associated with the landfill site although more detailed monitoring is necessary to determine its significance. Dissolved solids showed a lack of a regional pattern or apparent sources.

Heavy metal concentrations in the area were within the Provincial water quality objectives set out for the protection of aquatic life (refer to "Water Management, Goals, Policies, Objectives and Implementation Procedures of the Ministry of the Environment" November 1978). The trace contaminant portion of the program has been expanded recently to obtain a more comprehensive picture of heavy metal and trace organic levels in the area.

Water Quality at the R.C. Harris and Island Filtration Plants

The intake sampling program of raw and finished water at the R.C. Harris and Island Filtration plants confirmed (Appendix B) that the landfill activity did not have a detrimental effect on these important water uses. Both filtration plants continue to provide the public with excellent water quality which conforms to the guidelines set out by Health and Welfare Canada ("Guidelines for Canadian Drinking Water Quality 1978", National Health and Welfare) and MOE Drinking Water Objectives ("Water Management Goals, Policies, Objectives and Implementation Procedures of the Ministry of the Environment", November 1978).

APPENDIX A

TABLE 1 WATER QUALITY AT THE KEATING CHANNEL DISPOSAL SITE AND ALONG THE TORONTO WATERFRONT (June 9 - August 8, 1980).

TURBIDITY (F.T.U.)

STATION NUMBER	DEPTH (m)	June 9	June 12	June 16	June 30	July 3	July 8	July 10	July 18	July 21	July 30	July 31	Aug. 6	Aug. 8
1872	1.5	1.4		1.6	4.5	2.1	2.7	2.3	1.8	2.3	3.1	1.2	4.9	2.7
1981	1.5	1.8		2.3	2.2	2.7	1.8	1.8	1.5	1.6	2.0	1.2		2.7
1975	1.5	1.0	1.3	1.9	4.3	3.4	2.3	3.1	2.1	1.5	2.5	0.8	3.6	2.9
	5.0	1.6	1.3	1.5	5.7	3.0	1.5	2.2	1.8	1.4	2.5	1.3	3.5	1.6
	8.0	1.6	1.3		6.8	3.7	1.6	1.7	1.6	1.8	2.3	1.2	3.3	1.4
1983	1.5	1.6	0.9	1.8	3.8	2.4	1.9	1.6	1.5	2.1	2.7	1.0	3.9	2.7
	6.5	1.5	1.0	2.0	7.7	2.9	1.4	1.3	1.5	1.3	2.5	1.0	2.7	2.0
	11.0	2.3	1.4	1.5	4.7	2.1	3.4	1.6	1.6	1.6	2.5	1.1	2.5	2.1
1976	1.5	1.7	1.5	2.1	6.0	2.6	1.5	1.9	2.0	2.3	2.3	1.5	6.7	2.7
	4.5	1.2	1.6	1.6	6.6	2.4	3.5	1.4	2.3	1.5	2.5	1.8	4.8	2.1
	7.0	1.4	2.0	2.4	7.3	2.1	2.5	2.1	2.5	1.8	3.1	1.4	6.0	1.3
1982	1.5	1.3	1.0	1.5	5.4	2.5	2.2	1.6	1.6	1.5	2.2	1.3	5.8	2.5
	6.5	1.3	1.2	1.7	4.2	2.0	1.5	2.4	1.7	1.6	2.6	1.2	3.4	1.2
	11.0	1.3	2.2	1.7	8.7	1.9	1.4	1.7	1.7		2.7	1.0	2.8	1.2
1984	1.5	4.7	1.8	3.4	6.2	2.4	4.8	3.2	2.5	2.6	6.0	1.6	9.8	2.6
	4.0	6.1	2.5	2.7	6.3	2.5	5.4	3.1	2.4	2.5	5.0	1.7	5.3	3.0
	6.0	6.2	2.5	3.6	6.8		4.5	2.7	2.8	1.8	5.3	1.8	6.1	
1977	1.5	1.2	1.1	1.7	5.8	2.4	1.6	2.4	1.6	2.0	2.2	1.0	7.5	2.8
	5.5	1.7	1.1	1.7	5.5	2.3	3.2	1.6	1.6	1.9	2.8	1.7	3.2	1.8
	9.0	3.4	1.7	1.4	13.0	1.6	3.0	2.0	1.8	2.7	2.3	1.7	2.8	0.9
1733	1.5	3.2	2.3	2.0	6.8	2.6	3.6	3.0	1.7	2.7	2.3	1.3	3.0	2.8
	5.5	4.3	2.2	1.5	7.5	3.1	4.9	2.3	1.9	2.0	2.3	1.0	3.2	1.1
	9.0	6.3	2.3	2.3	7.8	2.3	3.8	3.0	2.0	2.0	2.2	3.2	3.1	1.3
1978	1.5	1.3	0.8	1.4	6.8	2.3	1.4	1.8	2.0	2.5	3.0	1.6	3.0	2.3
	6.5	1.3	1.2	1.6	7.0	3.2	2.5	1.8	1.8	1.8	2.7	2.6	3.0	1.7
	11.0	1.2	1.7	1.4	13.0	2.7	2.2	1.6	2.0	1.9	2.7	1.3	2.6	1.1
1979	1.5	1.9	2.0	2.0	12.0	2.5	3.0	2.3	2.2	2.8	2.2	2.3	3.5	1.6
	4.5				11.0	2.7	2.9	2.0	2.2	3.0	2.2	1.1	3.9	2.4
	7.0					3.2	2.6	2.7	1.8	2.5	2.4	1.3	6.4	2.8
1980	1.5	2.7	2.0	1.3	6.4	2.6	1.9	2.7	2.5	2.6	2.1	1.5	3.4	2.5
	5.5	2.1	2.0	1.7	6.5	2.8	2.6	2.2	1.7	2.7	2.9	2.2	3.4	1.1
	9.0	2.4	2.1	1.9	5.8	2.9	2.3	5.2	2.6	5.4		1.7	3.0	1.1
1419	1.5	2.2		2.8	7.3	3.9	1.3	2.5	2.5	3.2	3.1	1.3	3.7	2.6
1536	1.5	1.8	1.9	2.2	1.8	2.3		1.8	2.2	1.9		.95		2.7
	4.0	2.0	2.3	2.2	2.3	2.2		1.5	2.4	2.2		1.3		2.5
	6.0	2.1	1.9	2.1	3.2	2.2		2.0	1.8	1.9		1.6		2.5
1364	1.5	2.0	3.6	4.3	2.5	2.7		2.7	3.2	2.3		1.2		2.2
	4.0	2.1	3.4	5.6	2.6	2.8		2.5	2.7	2.5		1.2		2.7
	6.0	1.9	3.9	5.3	2.6	3.1		2.2	3.0	2.4		1.3		3.4
0202	1.5	2.2	2.7	3.0	2.1	2.8		2.5	2.9	2.7		3.0		2.7
	5.5	2.4	2.5	3.3	2.3	3.1		2.3	2.1	2.6		2.8		3.0
	9.0	2.0	2.3	3.0	2.4	2.6		2.1	1.8	2.2				2.8

TABLE 2 WATER QUALITY AT THE KEATING CHANNEL DISPOSAL SITE AND ALONG THE TORONTO WATERFRONT (June 9 - August 8, 1980).

SUSPENDED SOLIDS (mg/L)

STATION NUMBER	DEPTH (m)	June 9	June 12	June 16	June 30	July 3	July 8	July 18	July 21	July 30	July 31	Aug. 6	Aug. 8
1872	1.5	2		2	4	2	2	2	2	4	2	12	3
1981	1.5	2		3	4	3	2	3	2	3	2		2
1975	1.5	2		3	5	3	2	2	2	3	2	5	2
	5.0	1		2	7	3	2	2		3	3	3	3
	8.0	1			9	3	1	2		3	3	4	2
1983	1.5	1		3	5	3	2	2	2	3	2	6	3
	6.5	2		2	8	2	2	2		4	2	3	2
	11.0	2		2	6	2	2	3		4	2	3	3
1976	1.5	2		5	8	3	2	2	2	3	2	10	2
	4.5	2		4	8	3	3	3		4	3	6	3
	7.0	1		4	11	3	3	4		4	2	13	2
1982	1.5	1		2	6	3	2	2	2	3	2	8	2
	6.5	1		3	6	2	2	2		3	2	4	1
	11.0	1		2	11	2	2	2		3	2	4	2
1984	1.5	11		7	7	3	7	2	1	9	3	14	3
	4.0	12		8	8	3	8	3		6	4	7	4
	6.0	13		8	10		7	3		8	3	9	
1977	1.5	1		2	7	3	2	1	2	3	2	11	3
	5.5	1		2	8	4	2	2		3	2	3	2
	9.0	7		3	13	2	7	2		3	2	3	2
1733	1.5	7		3	9	3	3	2	4	3	2	7	5
	5.5	8		4	9	4	4	3		3	2	3	2
	9.0	12		3	10	3	4	3		3	6	4	5
1978	1.5	2		2	7	3	2	2	2	3	2	4	2
	6.5	2		2	6	3	2	2		3	3	3	2
	11.0	1		2	11	3	2	3		3	2	4	2
1979	1.5	3		2	9	3	2	2	3	4	2	13	2
	4.5				9	3	3	2		3	2	4	3
	7.0					3	3	2		3	2	30	5
1980	1.5	5		2	7	2	2	2	2	3	2	5	4
	5.5	4		2	7	3	2	3		3	6	3	2
	9.0	4		3	6	3	2	5			2	6	2
1419	1.5	3		2	8	12	1	4		6	4	11	4

TABLE) WATER QUALITY AT THE KEATING CHANNEL DISPOSAL SITE AND ALONG THE TORONTO WATERFRONT (June 9 - August 8, 1980).

CALCULATED DISSOLVED SOLIDS (mg/L)

STATION NUMBER	DEPTH (m)	June 9	June 12	June 16	June 30	July 3	July 8	July 18	July 21	July 30	July 31	Aug. 6	Aug. 8
1872	1.5	215		223	204	218	273	215	211	208	205	208	208
1981	1.5	215		207	219	218	218	224	215	211	208		208
1975	1.5	215		213	216	221	218	231	215	218	208	211	218
	5.0	215		221	217	221	218	228		217	216	199	197
	8.0	215			218	218	218	224		220	210	215	216
1983	1.5	215		220	214	221	218	218	211	208	208	211	211
	6.5	215		210	217	218	218	218		200	203	200	214
	11.0	215		217	215	218	218	218		197	203	215	215
1976	1.5	215		223	217	228	218	221	215	221	208	211	208
	4.5	215		223	215	224	218	224		220	211	202	196
	7.0	215		211	205	218	218	224		200	202	215	227
1982	1.5	215		212	220	224	218	230	211	228	208	211	211
	6.5	215		209	213	218	218	224		197	199	199	215
	11.0	215		220	210	218	218	224		193	210	215	218
1984	1.5	215		215	225	224	218	221	215	215	211	211	211
	4.0	215		218	211	224	218	224		199	195	199	207
	6.0	215		224	215		218	221		195	200	215	
1977	1.5	215		222	219	224	218	218	211	234	208	211	211
	5.5	215		222	222	218	218	221		191	202	198	208
	9.0	215		216	220	218	218	218		206	206	215	207
1733	1.5	215		223	216	221	218	221	250	237	208	211	234
	5.5	215		223	223	221	218	218		203	196	197	225
	9.0	215		228	219	218	218	234		198	205	215	207
1978	1.5	215		220	221	221	218	218	215	205	208	211	218
	6.5	215		218	219	218	218	218		196	205	199	199
	11.0	215		216	220	218	218	221		201	207	215	197
1979	1.5	215		234	218	237	218	224	257	211	208	211	234
	4.5				216	241	218	237		225	209	199	204
	7.0					237.	218.	231.		200.	212.	215.	196
1980	1.5	215		217	217	228	218	231	234	221	208	211	237
	5.5	215		253	197	231	218	231		205	219	192	220
	9.0	215		216	203	221	218	221			197	215	200
1419	1.5	263		268	241	321	224	273		241	276	254	276

TABLE 4 WATER QUALITY AT THE KEATING CHANNEL DISPOSAL SITE AND ALONG THE TORONTO WATERFRONT (June 9 - August 8, 1980).

TOTAL PHOSPHORUS (mg/L)

STATION NUMBER	DEPTH (m)	June 9	June 12	June 16	June 30	July 3	July 8	July 10	July 18	July 21	July 30	July 31	Aug. 6	Aug. 8
1872	1.5	.013		.019	.020	.022	.023	.016	.013	.022	.014	.013	.018	.022
1981	1.5	.015		.028	.027	.018	.021	.020	.029	.018	.037	.015	.022	.024
1975	1.5	.015	.025	.020	.027	.033	.023	.014	.049	.004	.066	.012	.027	.029
	5.0	.013												
	8.0	.014												
1983	1.5	.015	.018	.029	.028	.030	.018	.016	.012	.017	.028	.012	.027	.031
	6.5	.014												
	11.0	.012												
1976	1.5	.014	.023	.032	.027	.057	.019	.014	.024	.020	.075	.021	.036	.023
1982	1.5	.014	.015	.024	.027	.044	.019	.013	.051	.023	.097	.013	.030	.031
1984	1.5	.023	.021	.035	.029	.039	.026	.016	.019	.018	.050	.022	.027	.027
1977	1.5	.014	.019	.018	.031	.041	.018	.012	.013	.018	.119	.014	.030	.027
1733	1.5	.020	.041	.053	.027	.033	.029	.014	.029	.139	.124	.011	.025	.089
1978	1.5	.012	.016	.018	.031	.044	.018	.030	.016	.021	.016	.013	.026	.040
1979	1.5	.014	.137	.073	.027	.082	.131	.026	.025	.164	.036	.012	.032	.082
1980	1.5	.017	.025	.017	.028	.053	.072	.013	.011	.079	.060	.014	.026	.099
1419	1.5	.054		.266	.151	.450	.224	.018	.115	.390	.193	.210	.227	.145
1536	1.5	.021	.025	.025	.021	.025	.015	.023	.023	.017		.056		.031
	4.0	.039	.030		.021	.022	.015	.024	.022	.025		.051		.029
	6.0	.021	.026	.022	.024	.020	.018	.026	.015	.024		.051		.028
1364	1.5	.031	.043	.035	.036	.033	.032	.039	.042	.033		.045		.033
	4.0	.031	.038	.038	.034	.032	.032	.033	.046	.041		.035		.031
	6.0	.028	.040	.036	.034	.037	.032	.029	.033	.032		.040		.035
0202	1.5	.029	.035	.033	.027	.034	.031	.029		.034		.025		.034
	5.5	.027	.037	.036	.042	.035	.029	.024	.033	.031		.030		.024
	9.0	.029	.030	.035	.041	.024	.029	.026	.017	.031				.024

TABLE 5 WATER QUALITY AT THE KEATING CHANNEL DISPOSAL SITE AND ALONG THE TORONTO WATERFRONT (June 9 - August 8, 1980).

FILTERED REACTIVE PHOSPHATE (mg/L)

STATION NUMBER	DEPTH (m)	June 9	June 12	June 16	June 30	July 3	July 8	July 10	July 18	July 21	July 31
1872	1.5	.005		.002	.001	.005		.007	.003	.001	
1981	1.5	.004		.001	.001	.002	.003	.004	.008	.007	
1975	1.5	.005	.001	.001	.001	.003	.002	.002	.018	.001	
	5.0	.006									
	8.0	.005									
1983	1.5	.003	.001	.001	.001	.001	.001	.006	.004	.001	
	6.5	.005									
	11.0	.004									
1976	1.5	.006	.002	.001	.001	.015	.001	.006	.005	.001	
1982	1.5	.006	.001	.001	.001	.007	.001	.005	.018	.001	
1984	1.5	.005	.001	.001	.002	.008	.001	.007	.004	.002	
1977	1.5	.006	.001	.001	.001	.007	.001	.006	.001	.002	
1733	1.5	.005	.018	.006	.001	.003	.002	.008	.007	.081	
1978	1.5	.004	.002	.001	.001	.004	.001	.007	.002	.004	
1979	1.5	.003	.080	.022	.001	.038	.083	.006	.008		
1980	1.5	.004	.009	.001	.001	.015		.007	.002	.025	
1419	1.5	.100		.150	.072	.290		.006	.050		
1536	1.5	.006	.002	.001	.001	.003	.002	.008	.005	.001	.001
	4.0	.019	.001		.001	.003	.001	.004	.004	.001	.001
	6.0	.004	.002	.001	.001	.003	.001	.007	.003	.001	.001
1364	1.5	.007	.007	.001	.005	.001	.002	.011	.007	.001	.007
	4.0	.007	.004	.001	.002	.001	.001	.033	.007	.001	.004
	6.0	.006	.002	.001	.001	.002	.033	.006	.005	.001	.007
0202	1.5	.005	.005	.001	.001	.001	.003	.005		.002	.001
	5.5	.006	.002	.001	.013	.001	.002	.008	.008	.001	.001
	9.0	.006	.005	.001	.007	.003	.001	.005	.005	.001	

TABLE 6 WATER QUALITY AT THE KEATING CHANNEL DISPOSAL SITE AND ALONG THE TORONTO WATERFRONT (June 9 - August 8, 1980).

FILTERED AMMONIA (mg/L)

STATION NUMBER	DEPTH (m)	June 9	June 12	June 16	June 30	July 3	July 8	July 10	July 18	July 21	July 30	July 31	Aug. 6	Aug. 8
1872	1.5	.038		.014	.052	.094	.080	.016	.012	.026	.050	.025	.032	.010
1981	1.5	.044		.112	.112	.024	.026	.032	.370	.022	.306	.132	.058	.046
1975	1.5	.034	.061	.048	.168	.250	.120	.016	.556	.018	.510	.064	.080	.032
	5.0	.034												
	8.0	.032												
1983	1.5	.048	.038	.140	.204	.226	.024	.044	.112	.020	.204	.027	.108	.052
	6.5	.050												
	11.0	.036												
1976	1.5	.032	.048	.158	.130	.680	.100	.018	.242	.036	.580	.070	.118	.032
1982	1.5	.034	.036	.110	.166	.470	.044	.020	.620	.024	.870	.330	.110	.078
1984	1.5	.070	.050	.184	.162	.500	.128	.028	.240	.044	.322	.101	.122	.050
1977	1.5	.032	.046	.032	.202	.480	.044	.020	.060	.026	1.130	.031	.098	.062
1733	1.5	.040	.039	.520	.132	.302	.140	.020	.288	1.83	1.200	.076	.066	.830
1978	1.5	.034	.040	.012	.198	.390	.044	.020	.056	.028	.092	.052	.100	.232
1979	1.5	.036	.179	.930	.072	.150	1.21	.018	.304	2.15	.294	.047	.072	.840
1980	1.5	.034	.109	.010	.166	.650	.68	.018	.050	.850	.530	.054	.082	.980
1419	1.5	2.36		4.40	2.50	6.30	2.90	.018	2.00	4.75	1.120	3.650	2.36	1.88
1536	1.5	.086	.092	.092	.054	.036	.052	.032	.032	.024		.023	.118	
	4.0	.095	.097		.072	.050	.050	.058	.044	.022		.027	.138	
	6.0	.116	.101	.080	.102	.054	.058	.060	.034	.032		.089	.122	
1364	1.5	.050	.145	.082	.086	.062	.040	.024	.100	.060		.134	.052	
	4.0	.064	.195	.092	.044	.086	.040	.040	.088	.044		.146	.066	
	6.0	.064	.193	.094	.074	.102	.040	.046	.092	.054		.155	.078	
0202	1.5	.058	.059	.112	.070	.018	.010	.026		.022		.052	.028	
	5.5	.050	.107	.108	.042	.042	.016	.070	.056	.038		.070	.050	
	9.0	.052	.082	.114	.036	.054	.016	.064	.024	.028			.112	

TABLE 7 WATER QUALITY AT THE KEATING CHANNEL DISPOSAL SITE AND ALONG THE TORONTO WATERFRONT (June 9 - August 8, 1980).

FILTERED $NO_2 + NO_3$ (mg/L)

STATION NUMBER	DEPTH (m)	June 9	June 12	June 16	June 30	July 3	July 8	July 10	July 18	July 21	July 30	July 31	Aug. 6	Aug. 8
1872	1.5	.340		.305	.250	.240	.270	.345	.305	.260	.145	.960	.115	.113
1981	1.5	.340		.330	.265	.250	.280	.320	.355	.210	.155	.106	.110	
1975	1.5	.345	.310	.325	.255	.240	.260	.350	.350	.185	.155	.096	.165	.132
	5.0	.345												
	8.0	.350												
1983	1.5	.335	.285	.315	.250	.240	.260	.305	.340	.190	.150	.086	.155	
	6.5	.340												
	11.0	.350												
1976	1.5	.345	.320	.330	.255	.245	.265	.345	.350	.240	.165	.115	.180	.132
1982	1.5	.340	.280	.320	.250	.240	.270	.340	.350	.170	.160	.091	.145	.146
1984	1.5	.340	.325	.325	.270	.250	.265	.340	.350	.240	.165	.125	.160	.132
1977	1.5	.340	.290	.310	.255	.245	.270	.335	.370	.145	.170	.101	.150	.141
1733	1.5	.340	.340	.320	.260	.245	.255	.345	.355	.340	.175	.101	.160	.211
1978	1.5	.340	.285	.335	.255	.255	.240	.340	.230	.210	.120	.106	.160	.183
1979	1.5	.345	.345	.350	.265	.255	.255	.345	.350	.330	.145	.134	.165	.211
1980	1.5	.345	.340	.305	.260	.250	.245	.340	.355	.310	.175	.115	.160	.202
1419	1.5	.305		.290	.265	.225	.250	.345	.365	.360	.210	.235	.360	.357
1536	1.5	.250	.325	.325	.220	.245	.250	.158	.280	.290		.077	.125	.211
	4.0	.245	.325		.220	.250	.240	.229	.275	.305		.077	.170	.183
	6.0	.235	.325	.325	.240	.260	.255	.282	.335	.310		.086	.170	.188
1364	1.5	.225	.350	.355	.350	.280	.230	.229	.320	.295		.326	.300	.207
	4.0	.250	.355	.350	.300	.280	.240	.258	.300	.290		.322	.305	.216
	6.0	.260	.355	.340	.310	.285	.250	.267	.295	.320		.317	.265	.211
0202	1.5	.220	.335	.325	.295	.275	.250	.253		.285		.144	.210	.221
	5.5	.255	.330	.330	.295	.275	.250	.282	.345	.330		.144	.175	.226
	9.0	.275	.335	.335	.295	.260	.250	.296	.365	.345			.245	.226

TABLE 8 WATER QUALITY AT THE KEATING CHANNEL DISPOSAL SITE AND ALONG THE TORONTO WATERFRONT (June 9 - August 8, 1980).

TOTAL KJELDAHL (mg/L)

STATION NUMBER	DEPTH (m)	June 9	June 12	June 16	June 30	July 3	July 8	July 10	July 18	July 21	July 30	July 31	Aug. 6	Aug. 8
1872	1.5	.28		.35	.35	.51	.49	.25	.32	.42	.30	.29	.30	.31
1981	1.5	.25		.48	.51	.29	.47	.29	.64	.35	.65	.29	.33	.37
1975	1.5	.27	.32	.34	.50	.59	.57	.19	.91	.36	.92	.26	.37	.39
	5.0	.27												
	8.0	.37												
1983	1.5	.24	.29	.46	.52	.56	.41	.32	.33	.34	.51	.26	.37	.61
	6.5	.25												
	11.0	.21												
1976	1.5	.33	.30	.58	.44	1.14	.50	.20	.50	.37	1.05	.35	.37	.35
1982	1.5	.29	.28	.40	.51	.86	.41	.22	.95	.39	1.37	.27	.37	.44
1984	1.5	.28	.28	.54	.49	.89	.48	.19	.46	.35	.72	.37	.38	.39
1977	1.5	.32	.30	.35	.50	.86	.40	.22	.27	.41	1.62	.28	.37	.40
1733	1.5	.28	.68	.97	.85	.63	.49	.20	.58	2.5	1.78	.26	.34	1.26
1978	1.5	.30	.28	.30	.55	1.42	.41	.29	.33	.34	.28	.28	.38	.60
1979	1.5	.26	2.25	1.37	.41	1.61	1.71	.23	.54	2.8	.59	.34	.43	1.21
1980	1.5	.28	.35	.28	.47	1.05	1.12	.20	.23	1.32	1.00	.30	.37	1.40
1419	1.5	3.25		5.66	3.13	8.10	3.41	.22	2.75	6.6	1.85	4.90	2.68	
1536	1.5	.43	.36	.42	.42	.39	.42	.34	.37	.47		.51		
	4.0	.38	.37		.38	.34	.39	.37	.37	.39		.55		
	6.0	.42	.35	.37	.42	.36	.39	.35	.24	.45		.52		
1364	1.5	.55	.59	.49	.57	.45	.51	.49	.58	.50		.51		
	4.0	.51	.51	.56	.44	.42	.53	.41	.47	.55		.41		
	6.0	.45	.54	.48	.47	.47	.48	.33	.45	.40		.45		
0202	1.5	.45	.44	.52	.46	.45	.52	.37		.50		.34		
	5.5	.42	.45	.52	.40	.41	.46	.38	.59	.41		.40		
	9.0	.55	.37	.52	.39	.32	.47	.37	.25	.46				

TABLE 9 WATER QUALITY AT THE KEATING CHANNEL DISPOSAL SITE AND ALONG THE TORONTO WATERFRONT (June 9 - August 8, 1980).

CONDUCTIVITY 25 C (µmos/cm)

STATION NUMBER	DEPTH (m)	June 9	June 12	June 16	June 30	July 3	July 8	July 10	July 18	July 21	July 30	July 31	Aug. 6	Aug.
1872	1.5	330				335	420	335	330	325	320	315	320	320
1981	1.5	330				335	335	335	345	330	325	320		320
1975	1.5	330	335			340	335	335	355	330	335	320	325	320
	5.0	330	335			340	335	335	350					
	8.0	330	330			335	335	335	345				330	
1983	1.5	330	330			340	335	330	335	325	320	320	325	325
	6.5	330	330			335	335	335	335					
	11.0	330	330			335	335	335	335				330	
1976	1.5	330	335			350	335	335	340	330	340	320	325	320
	4.5	330	335			345	335	335	345					
	7.0	330	330			335	335	335	345				330	
1982	1.5	330	330			345	335	335	355	325	350	320	325	325
	6.5	330	330			335	335	335	345					
	11.0	330	330			335	335	335	345				330	
1984	1.5	330	335			345	335	335	340	330	330	325	325	325
	4.0	330	335			345	335	335	345					
	6.0	330	335				335	335	340				330	
1977	1.5	330	335			345	335	335	335	325	360	320	325	325
	5.5	330	335			335	335	335	340					
	9.0	330	330			335	335	335	335				330	
1733	1.5	330	345			340	335	335	340	385	365	320	325	360
	5.5	330	345			340	335	335	335					
	9.0	330	350			335	335	335	360				330	
1978	1.5	330	330			340	335	335	335	330	315	320	325	335
	6.5	330	335			335	335	335	335					
	11.0	330	330			335	335	335	340				330	
1979	1.5	330	390			365	370	335	345	395	325	320	325	360
	4.5					370	350	335	365					
	7.0					365	340	335	355				330	
1980	1.5	330	335			350	355	335	335	360	340	320	325	365
	5.5	330	335			355	340	335	335					
	9.0	330	335			340	345	335	340				330	
1419	1.5	330				600	335	335	420	460	370	460	390	425
1536	1.5	335	340			330	335	345	325	340	340	320	320	335
	4.0	335	340			330	335	340	335	340	340	315	330	330
	6.0	335	335			330	335	335	335	335	340	320	330	330
1364	1.5	350	360			350	350	355	345	370	355	340	350	335
	4.0	350	360			355	355	355	345	345	350	340	355	340
	6.0	340	360			350	355	350	335	345	340	345	345	335
0202	1.5	350	355			345	345	350	345	350	340	330	330	340
	5.5	345	350			345	345	350	335	335	340	330	325	330
	9.0	345	340			340	345	335	335	335	335		320	330

TABLE 10 WATER QUALITY AT THE KEATING CHANNEL DISPOSAL SITE AND ALONG THE TORONTO WATERFRONT (June 9, 1980).

METALS

STATION NUMBER	DEPTH (m)	Cr mg/L	Ni mg/L	Pb mg/L	Zn mg/L	Cu mg/L	Al mg/L	Hg* µg/L	Fe mg/L
1872	1.5	<.02	<.02	< .03	< .01	< .01	< .02	.04	
1981	1.5	<.02	<.02	< .04	< .01	< .01	< .02	.05	
1975	1.5	<.02	<.02	.03	< .01	< .01	< .02	.04	
1983	1.5	<.02	<.02	< .03	< .01	< .01	< .02	.05	
1976	1.5	<.02	<.02	< .03	< .01	< .01	< .02	.05	
1982	1.5	<.02	<.02	< .03	< .01	< .01	< .02	.05	
1984	1.5	<.02	<.02	< .03	< .01	< .01	< .22	.07	
1977	1.5	<.02	<.02	< .03	< .01	< .01	< .07	.05	
1733	1.5	<.02	<.02	< .04	< .01	< .01	< .23	.04	
1978	1.5	<.02	<.02	< .03	< .01	< .01	< .02	.04	
1979	1.5	<.02	<.02	< .03	< .01	< .01	.04	.05	
1980	1.5	<.02	<.02	< .03	< .01	< .01	.17	.04	
1419	1.5	<.02	<.02	< .03	< .01	< .01	<.02	.06	
1536	1.5			< .03	< .01	< .01	.06	.04	.09
	4.0			< .03	< .01	.02	.02	.04	.14
	6.0			< .03	.02	.02	.06	.03	.12
1364	1.5			< .03	< .01	< .01	.09	.06	.13
	4.0			< .03	< .01	< .01	.06	.04	.12
	6.0			< .03	< .01	< .01	.07	.04	.13
202	1.5			< .03	< .01	< .01	.09	.05	.09
	5.5			< .03	< .01	.02	.05	.05	.09
	9.0			< .03	< .01	< .01	.09	.03	.10
1978 IJC Spec. Objective		.050	.025	.025	.030	.005			.3
1978 MOE Aquatic Life Objective		.100	.025	.025	.030	.005			.3

* Total Mercury

TABLE 11

WATER QUALITY

ISLAND FILTRATION PLANT - RAW & FINISHED WATER (July 23 - August 1, 1980)

Date	Source	F.R.P. µg/L	T.P. µg/L	NO_2+NO_3 µg/L	NH_3 µg/L	T.K.N. µg/L	Cond. µmos cm^{-1}	Turb. F.T.U.	Si µg/L	T.S. mg/L	S.S. mg/L
July 23	raw	4	20	330	48	340	335	1.20	150	220	2
	finished	2	8	330	22	190	340	0.65	100	222	1
July 25	raw	2	10	320	44	310	340	1.90	150	222	1
	finished	1	5	325	18	170	340	1.70	350	221	<1
July 28	raw	2	20	310	62	350	335	1.80	150	220	2
	finished	5	7	320	12	210	340	0.45	350	221	<1
July 29	raw	1	18	280	70	340	330	1.60	100	220	5
	finished	3	7	285	20	190	340	0.30	300	223	2
July 31	raw	2	24	230	42	330	335	1.30	150	220	2
	finished	2	8	205	<2	170	335	0.40	300	218	<1
Aug. 1	raw	1	11	255	74	200			250		
	finished	2	3	275	8	330			150		
1978 H & WC Drinking Water Max. Allow. Conc.				11000							

F.R.P. - Filtered Reactive Phosphorus
T.P. - Total Phosphorus
T.K.N. - Total Kjeldahl
T.S. - Total Solids
S.S. - Suspended Solids

TABLE 12

WATER QUALITY

ISLAND FILTRATION PLANT - RAW & FINISHED WATER (August 13 - August 28, 1980)

Date	Source	T.P. µg/L	NO_2+NO_3 µg/L	NH_3 µg/L	T.K.N. µg/L	Cond. µmos cm^{-1}	Turb. F.T.U.	Hardness mg/L	Phenols µg/L	D.O.C. mg/L	Colour hz	Alk. mg/L	pH
Aug. 13	raw	12	260	96	290	330	1.70	136	<1	2.3	9	95	7.83
	finished	5	250	24	160	335	0.60	135	<1	1.9		82	7.25
Aug. 14	raw	14	275	76	290	330	1.40	135	<1	2.4	19	94	7.80
	finished	3	265	26	190	330	0.20	135	<1	2.1	3	90	7.60
Aug. 22	raw	24	160	54	300	320	4.00	132	<1	2.2	9	92	8.25
	finished	7	160	8	190	330	0.45	131	<1	1.8	5	82	7.49
Aug. 26	raw	12	220	32	240	325	1.50	131	<1	2.0	3	92	7.96
	finished	4	195	6	160	330	0.20	133	<1	1.9	2	83	7.42
Aug. 27	raw	6	365	33	200	335	1.30	137	<1	2.0	3	97	7.83
	finished	< 1	315	8	150	335	0.35	136	<1	1.7	1	89	7.40
Aug. 28	raw	17	330	50	260	318	1.60	134	<1	2.1	7.7	95	7.62
	finished	8	250	12	180	324	0.64	132	<1	2.0	<1	85	7.36
1978 H & WC Drinking Water Max. Allow. Conc.			11000						2				6.5-8.5

T.P. - Total Phosphorus
T.K.N.- Total Kjeldahl
D.O.C.- Dissolved Organic Carbon

TABLE 13

WATER QUALITY

ISLAND FILTRATION PLANT - RAW & FINISHED WATER (July 22 - August 1, 1980)

Date	Source	Total Coliforms org/100 mls	Fecal Coliforms org/100 mls	Fecal Strep. org/100 mls	Pseud. org/100 mls	Heterotrophs org/mls	Chlorophyll a 404 µg/L	Chlorophyll b 405 µg/L	Chlorophyll a 406 µg/L
July 22	raw	56	4	<4	<2	14500			
	finished	<4	<4	<4	<2	<10000			
July 23	raw	52	<2	<4	<2	15000	7.0	1.0	6.5
	finished	< 4	<2	<4	<2	<10000	0.3	0.3	0.1
July 24	raw	< 4	<2	<4	<2	<10000			
	finished	< 4	<2	<4	<2	<10000			
July 25	raw	< 4	<2	<4	<2	<10000	3.7	0.4	3.1
	finished	< 4	<2	<4	<2	<10000	0.2	0.1	0.1
July 28	raw	8	<2	8	<2	40000	4.6	0.5	1.1
	finished	< 4	<2	4	<2	<10000	0.1	0.1	< 0.1
July 29	raw	44	<2	<4	<2	50000	7.4	0.8	5.8
	finished	< 4	<2	<4	<2	<10000	0.1	0.1	0.1
July 30	raw	68	16	12	<2	19500			
	finished	< 4	<4	<4	<2	<10000			
July 31	raw	224	<2	8	<2	<10000	5.6	0.5	5.0
	finished	< 4	<2	<4	<2	<10000	0.2	0.2	0.1
Aug. 1	raw	20	<4	<4	<2		4.9	0.1	4.3
	finished	4	<4	<4	<2	<10000	1.0	< 0.1	1.0

Chlorophyll a 404 - uncorrected for pheophytins
Chlorophyll a 406 - corrected for pheophytins

(1978 H & WC Drinking Water Guidelines)

* 1. no sample should contain more than 10 total coliform organisms per 100 mL.
2. not more than 10 percent of the samples taken in a 30-day period should show the presence of coliform organisms.
3. not more than 2 consecutive samples from the same site should show the presence of coliform organisms.

TABLE 14

WATER QUALITY

ISLAND FILTRATION PLANT - RAW & FINISHED WATER (July 10 - August 1, 1980)

Date	Source	Cr µg/L	Ni µg/L	Pb µg/L	Zn µg/L	Cu µg/L	Al µg/L	Hg* µg/L	Cd µg/L
July 10	raw	<2	<2	<2	7	64	100	<0.03	
	finished	<2	<2	<2	<1	< 1	200	<0.03	
July 17	raw	<2	<2	<2	6	7	70	<0.04	
	finished	<2	<2	<2	<1	< 1	180	<0.04	
July 23	raw	<2	<2	<2	5	4	90	0.03	<.1
	finished	<2	<2	<2	<1	<1	220	0.06	<.1
July 25	raw	<2	<2	<2	9	10	100		<.1
	finished	2	2	2	1	<1	170		.1
July 28	raw	<2	<2	<2	9	8	100		.2
	finished	<2	<2	<2	<1	<1	160		.1
July 29	raw	<2	<2	<2	7	10	110		.1
	finished	<2	<2	<2	<1	<1	240		.1
July 30	raw	<2	<2	<3	29	9	58	<0.02	<.2
	finished	<2	<2	<3	<1	<1	150	<0.02	<.2
July 31	raw	<2	<2	<3	10	9	46	0.07	<.2
	finished	<2	<2	<3	<1	<1	150	<0.04	<.2
Aug. 1	raw	<2	<2	<3	7	6	35	0.04	<.2
	finished	<2	<2	<3	<1	<1	150	0.09	<.2
1978 H & WC Drinking Water Max. Allow. Conc.		50		50	5000	1000		1	5

* Total Mercury

TABLE 15

WATER QUALITY

ISLAND FILTRATION PLANT - RAW & FINISHED WATER (August 13 - August 26, 1980)

Date	Source	Cd µg/L	Cr µg/L	Cu µg/L	Pb µg/L	Zn µg/L	Total Hg µg/L	Filtered Hg µg/L
Aug. 13	raw	< .2	≤ 2	8	< 3	10	< 0.04	
	finished	< .2	< 2	< 1	< 3	< 1	0.64	0.14
Aug. 14	raw	.3	< 2	9	< 3	12	< 0.04	< 0.04
	filter composite	< .2	2	< 1	< 3	< 1	0.88	< 0.04
Aug. 22	raw	< .5	< 2	20	< 3	22	< 0.02	< 0.02
	finished	< .5	3	5	< 3	3	0.15	0.04
Aug. 26	raw	< .5	< 2	21	< 3	29	< 0.02	< 0.02
	finished	< .5	< 2	2	< 3	5	< 0.02	< 0.02
1978 H & WC Drinking Water Max. Allow. Conc.		5	50	1000	50	5000	1	

TABLE 16

WATER QUALITY

X-none detected
All concentrations µg/L

ISLAND FILTRATION PLANT - RAW & FINISHED WATER (July 10 - August 14, 1980)

Date	Source	PCB	HCB	α - BHC	LINDANE	β - BHC	HEPTACHLOR	HEPT. EPOXIDE	ENDRIN	THIODAN I	THIODAN II	ALDRIN	DIELDRIN	pp DDE	op DDT	pp DDD	pp DDT	α - CHLORDANE	- CHLORDANE	MIREX
July 10	raw	X	X	X	.001	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	finished	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
July 17	raw	X	X	.004	.002	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	finished	X	X	.004	.002	X	.001	X	X	X	X	X	X	X	X	X	X	X	X	X
July 22	raw	X	X	.007	.002	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	finished	X	X	.006	.002	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
July 23	raw	X	X	.007	.003	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	finished	X	X	.008	.002	X	.001	X	X	X	X	X	X	X	X	X	X	X	X	X
July 24	raw	X	X	.007	.002	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	finished	X	X	.007	.002	X	.001	X	X	X	X	X	X	X	X	X	X	X	X	X
July 25	raw	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	finished	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
July 28	raw	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	finished	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
July 29	raw	X	X	.010	.020	.002	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	finished	X	X	.005	.002	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
July 30	raw	X	X	.006	.002	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	finished	X	X	.007	.002	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
July 31	raw	.050	X	.015	.020	.006	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	finished	X	X	.005	.001	.001	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Aug 13	raw	X	X	.006	.002	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	finished	X	X	.007	.002	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Aug 14	raw	X	X	.007	.002	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	finished	X	X	.007	.002	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
1978 H & WC Drinking Water Max. Allow. Conc.		-	-	-	4	-	3		.2	-	-	.7		30				7		-

TABLE 17

WATER QUALITY

R. C. HARRIS FILTRATION PLANT - RAW & FINISHED WATER (July 23 - August 1, 1980)

Date	Source	F.R.P. µg/L	T.P. µg/L	$NO_2 + NO_3$ µg/L	NH_3 µg/L	T.K.N. µg/L	Cond. µmos cm^{-1}	Turb. F.T.U.	Si µg/L	T.S. mg/L	S.S. mg/L
July 23	raw	2	14	310	56	280	340	2.60	100	224	3
	finished	2	6	325	136	300	335	0.65	350	218	<1
July 25	raw	1	11	315	50	250	335	2.20	150	219	1
	finished	4	11	310	136	330	335	1.60	400	219	1
July 28	raw	<1	21	250	36	390	330	1.70	50	217	2
	finished	9	15	280	112	320	335	0.50	300	218	<1
July 29	raw	1	15	200	24	300	325	1.30	50	214	3
	finished	3	10	225	118	300	335	0.50	250	218	<1
July 31	raw	1	22	170	44	330	330	1.60	200	218	3
	finished	5	13	170	118	300	335	0.55	300	219	1
Aug. 1	raw	1	17	230	56	380		73	100		
	finished	2	5	240	140	320		73	250		
1978 H & WC Drinking Water Max. Allow. Conc.				11000							

F.R.P. - Filtered Reactive Phosphorus
T.P. - Total Phosphorus
T.K.N. - Total Kjeldahl
T.S. - Total Solids
S.S. - Suspended Solids

TABLE 18

WATER QUALITY

R. C. HARRIS FILTRATION PLANT - RAW & FINISHED WATER (August 13 - August 29, 1980)

Date	Source	T.P. µg/L	NO_2+NO_3 µg/L	NH_3 µg/L	T.K.N. µg/L	Cond. µmos cm^{-1}	Turb. F.T.U.	Hardness mg/L	Phenols µg/L	D.O.C. µg/L	Colour hz	Alk. mg/L	pH
Aug. 13	raw	14	265	64	270	330	3.30	135	<1	2.4		94	7.84
	finished	7	260	14	180	335	0.20	136	<1	2.9		86	7.36
Aug. 14	raw	14	265	60	290	330	1.30	135	<1	2.2	8.8	96	7.57
	finished	6	260	138	310	335	0.30	134	<1	2.2	5.2	89	7.33
Aug. 15	raw	6	340	26	210	330	1.10	137	<1	2.2	5.2	96	7.65
	finished	5	330	150	320	335	0.35	138	<1	2.1	5.2	91	7.45
Aug. 18	raw	13	355	80	280	335	1.30	137	<1	2.1	6.5	96	7.78
	finished	8	350	138	260	340	0.35	137	<1	2.0	5.2	90	7.37
Aug. 19	raw	12	340	50	260	330	1.70	136	<1	2.3	7.4	97	7.79
	finished	6	325	168	310	335	0.50	136	<1	2.2	5.4	89	7.38
Aug. 20	raw	15	285	30	290	330	1.90	134	<1	2.6	7.6	96	7.92
	finished	6	295	160	300	330	0.45	135	<1	2.4	6.8	92	7.58
Aug. 21	raw	18	225	96	350	330	1.70	133	<1	2.2	6.0	90	7.84
	finished	9	225	140	280	330	0.40	133	<1	2.0	3.0	87	7.58
Aug. 22	raw	18	110	26	270	314	2.80	130	<1	2.2	5.8	91	8.32
	finished	6	125	146	290	319	0.62	131	<1	2.1	0.4	85	7.77
Aug. 25	raw	17		30	300	315	1.40	128	<1	2.3	7.0	88	8.29
	finished	9		148	300	320	0.27	128	<1	2.1	5.0	84	7.64
Aug. 26	raw	11	120	36	250	320	1.10	129	<1	2.1	3.0	90	8.13
	finished	9	130	142	290	320	0.30	131	<1	2.1	1.0	86	7.73
Aug. 27	raw	14	165	40	250	320	0.90	130	<1	2.1	2.0	90	8.07
	finished	9	200	174	290	320	0.03	129	<1	2.1	1.0	86	7.61
Aug. 28	raw	13	135	41	270	320	1.70	130	<1	2.1	2.0	90	8.15
	finished	7	155	149	290	325	0.40	130	< 1	2.0	4.0	85	7.65
Aug. 29	raw	21	125	60	310	311	3.10	127	<1	2.4	5.6	89	8.18
	finished	9	125	146	290	315	0.87	129	<1	2.2	1.0	82	7.60
1978 H & WC Drinking Water Max. Allow. Conc.			11000						2				6.5 - 8.5

T.P. - Total Phosphorus
T.K.N. - Total Kjeldahl
D.O.C. - Dissolved Organic Carbon

TABLE 19

WATER QUALITY

R.C. HARRIS FILTRATION PLANT - RAW & FINISHED WATER (July 22 - August 1, 1980)

Date	Source	Total Coliforms org/100 mls	Fecal Coliforms org/100 mls	Fecal Strep. org/100 mls	Pseud. org/100 mls	Heterotrophs org/mls	Chlorophyll		
							a 404 µg/L	b 405 µg/L	a 406 µg/L
July 22	raw	36	<4	<4	<2	10000			
	finished	<4	<4	<4	<2	<10000			
July 23	raw	8	<2	<4	<2	11500	5.6	0.6	4.7
	finished	<4	<2	<4	<2	<10000	0.3	0.3	0.2
July 24	raw	60	<3	<4	<2	21000			
	finished	<4	<2	<4	<2	<10000			
July 25	raw	4	<4	<4	<2	<10000	2.2	0.4	1.9
	finished	<4	<2	<4	<2	<10000	0.1	<0.1	<0.1
July 28	raw	76	<2	<4	<2	16500	9.6	1.2	2.6
	finished	<4	<2	<4	<2	<10000	0.3	0.2	0.1
July 29	raw	<4	<2	<4	<2	<10000	3.9	0.5	3.3
	finished	<4	<2	<4	<2	<10000	0.2	0.1	0.1
July 30	raw	92	8	4	<2	<10000			
	finished	<4	<2	<4	<2	<10000			
July 31	raw	<4	<2	<4	<2	<10000	5.7	0.2	4.8
	finished	<4	<2	<4	<2	<10000	0.3	0.1	0.2
Aug. 1	raw	4	<4	<4	<2	11000	5.6	0.5	3.9
	finished	<4	<4	<4	<2	<10000	0.2	0.2	0.2

chlorophyll a 404 - uncorrected for pheophytins
chlorophyll a 406 - corrected for pheophytins

(1978 H & WC Drinking Water Guidelines)

* 1. no sample should contain more than 10 total coliform organisms per 100 mL.
2. not more than 10 percent of the samples taken in a 30-day period should show the presence of coliform organisms.
3. not more than 2 consecutive samples from the same site should show the presenc
of coliform organisms.
4. none of the coliform organisms detected should be fecal coliforms.

TABLE 20

WATER QUALITY

R. C. HARRIS FILTRATION PLANT - RAW & FINISHED WATER (July 23 - August 1, 1980)

Date	Source	Cr μg/L	Ni μg/L	Pb μg/L	Zn μg/L	Cu μg/L	Al μg/L	Hg * μg/L	Cd μg/L
July 23	raw	<2	<2	<2	<1	<1	70	0.03	<.1
	finished	<2	<2	<2	1	<1	140	<0.03	<.1
July 25	raw	<2	<2	3	<1	<1	<8		<.1
	finished	<2	<2	<2	<1	<1	90		<.1
July 28	raw	<2	<2	<2	<1	<1	80		.2
	finished	<2	<2	<2	<1	4	160		.2
July 29	raw	<2	<2	<2	<1	4	100		.1
	finished	<2	<2	<2	<1	4	250		.2
July 30	raw	<2	<2	<3	1	<1	45	0.04	<.2
	finished	<2	<2	<3	2	2	230	0.07	<.2
July 31	raw	<2	<2	<3	1	<1	52	<0.04	<.2
	finished	<2	<2	<3	1	<1	120	<0.04	<.2
Aug. 1	raw							<0.04	
	finished	<2	<2	<3	1	<1	160	0.04	<.2
1978 H & WC Drinking Water Max. Allow. Conc.		50		50	5000	1000		1	5

* Total Mercury

TABLE 21

WATER QUALITY

R.C. HARRIS FILTRATION PLANT - RAW & FINISHED WATER (August 13 - August 27, 1980)

Date	Source	Cd µg/L	Cr µg/L	Cu µg/L	Pb µg/L	Zn µg/L	Total Hg µg/L	Filtered Hg µg/L
Aug. 13	raw	<.2	<2	2	<3	4		
	finished	< .2	<2	2	<3	6	<0.04	<0.04
Aug. 14	raw	< .2	<2	5.6	<3	3.2	<0.04	<0.04
	finished	< .2	<2	5.6	<3	3.9	<0.04	<0.04
Aug. 15	raw	< .2	<2	3.6	<3	2.6	<0.04	<0.04
	finished	< .2	<2	2.3	<3	2.6	<0.04	<0.04
Aug. 18	raw	< .2	<2	2.7	<3	2.7	<0.04	<0.04
	finished	< .2	<2	2.1	<3	2.1	<0.04	<0.04
Aug. 19	raw	< .2	<2	2.8	<3	2.2	<0.04	<0.04
	finished	< .2	<2	2.5	<3	2.2	<0.04	<0.04
Aug. 20	raw	< .2	< 2	2.7	< 3	3.0	< 0.04	<0.04
	finished	< .2	< 2	1.2	< 3	2.3	< 0.04	<0.04
Aug. 21	raw	< .2	< 2	9.1	< 3	4.5	< 0.04	<0.04
	finished	< .2	< 2	1.0	< 3	2.1	< 0.04	<0.04
Aug. 22	raw	< .2	< 2	5.1	< 3	5.6	< 0.02	0.02
	finished	< .2	< 2	< 1	< 3	6.4	< 0.02	<0.02
Aug. 25	raw	< .2	< 2	< 1	< 3		< 0.04	<0.04
	finished	< .2	< 2	< 1	< 3		< 0.04	<0.04
Aug. 26	raw	< .5	5	4	< 3	8	< 0.02	<0.02
	finished	< .5	< 2	3	< 3	7	< 0.02	<0.02
Aug. 27	raw	< .5	3	5	< 3	9	< 0.02	<0.02
	finished	< .5	< 2	2	< 3	9	< 0.02	<0.02
1978 H & WC Drinking Water Max. Allow. Conc.		5	50	1000	50	5000	1	

APPENDIX B

CRUISE PLAN

MAY 15 - AUGUST 15, 1980

TORONTO AREA DAILY SAMPLING AND EAST HEADLAND LAKEFILL/DREDGE SPOIL DISPOSAL STUDIES

PROJECT 57

1980 CRUISE PLAN
TORONTO AREA DAILY SAMPLING
AND EAST HEADLAND LAKEFILL/DREDGE SPOIL DISPOSAL STUDIES

PROJECT 57

A. SCHEDULE

Stations 1364, 202 and 1536 are to be sampled every weekday morning exclusive of holidays, during the period May 12 to August 15. Stations 1975, 1976, 1977, 1733, 1978, 1979, 1980, 1981, 1982, 1543 and 1545 are to be sampled every Tuesday and Friday during this same period.

B. SAMPLING STATION LOCATIONS (MAPS ATTACHED)

Three regular stations designated: 1364 (Inner Harbour), 202 (Outer Harbour) and 1536 (at Island water intake).

Thirteen stations adjacent to lakefill/dredge spoil disposal activity on the Outer Harbour East Headland.

C. SAMPLING PROCEDURES

Profiles of temperature (°C) and dissolved oxygen will be taken at stations 1364, 202 and 1536 every metre to 0.5 m. off bottom and will be documented on the provided cast record sheets.

Sample stations 1364, 202, 1536, 1975, 1976, 1977, 1733, 1978, 1979, 1980, 1982, 1983, 1984 in the following manner:

a) 1.5 m, mid-depth, 2 m off bottom
   or, if a thermocline is present (for 1364, 202 and 1536 only):
b) 1.5 m, mid-thermocline, 2 m off bottom.

NOTE: If turbidity meter equipment is available a turbidity profile will be taken at stations 1975, 1976, 1977, 1733, 1978, 1979, 1980, 1982, 1983, 1984. If depth sampling does not coincide with a turbidity peak at depth, then an additional depth sample will be taken at peak turbidity depth.

D. PARAMETER REQUESTS

1. Onshore Analysis (Stations 1364, 202 and 1536)

a) On Mondays (or Tuesday following holiday Mondays):

Group A

Total dissolved phosphorous (211), total phosphorus, nitrate plus nitrite, total Kjeldahl nitrogen, ammonia, dissolved silica, turbidity, chlorophyll a & b, chloride, conductivity, chlorophyll (406), total coliform, fecal coliform, fecal streptococci, total plate count (heterotrophs) and Pseudomonas aeruginosa.

Group B

Na (066), Ca (072), PCB's pesticide scan, mercury (code 235), lead (code 230), zinc (code 250), copper (code 226), aluminum (code 203), iron, phenols.

b) Tuesday to Friday: As above, except omit Group B.

2. Onboard Analysis Everyday

Temperature, pH, Secchi disc, colour and dissolved oxygen, wind speed and direction (using anemometer), air temperature, cloud cover.

NOTE: In addition, average daily wind speed and direction, precipitation and % cloud cover will be tabulated from Island Airport weather records and recorded into field notes for every day from May 12 to August 15 inclusive.

3. East Headland Sampling (Monday and Thursday only)

Parameter requests for East Headland sample stations 1419, 1975, 1976, 1977, 1733, 1978, 1979, 1980, 1981, 1982, 1983, 1984 and 1872 will be as follows:

a) surface samples (1.5 m) - conductivity, total phosphorus, total dissolved phosphorus, NO_2+, NO_3, NH_3, total Kjeldahl nitrogen, turbidity, suspended solids, total dissolved solids. Sample stations 1419, 1872 and 1981 at surface only.

b) depth samples - turbidity, suspended solids, total dissolved solids only.

Special parameter requests for the stations listed under 3 a) and b) above (Group B plus chromium and nickel) will be made on a limited basis (i.e. four or five times during course of contract).

4. In addition, every Monday and Thursday and following every rain event, the extent of the plume from the lakefill/dredge spoil disposal activity on the East Headland will be visually determined, photographs taken if required, and the plume extent located on a map as part of the field notes.

E. SAMPLE BOTTLE REQUIREMENTS AND PRESERVATION TECHNIQUES

1. Monday to Friday at Each Station

a) A 1 L. glass bottle filled to the top so as to exclude air bubbles for turbidity, chloride and conductivity analyses. Keep sample iced and in the dark.

b) A 6 oz. plastic jar filled 2/3 full for nutrient analyses. Keep sample iced and then freeze at the laboratory when the samples are delivered.

c) A 6 oz. plastic jar for silica analysis (stations 1364, 202, 1536 only).

d) A 6 oz. sterile glass bottle for bacteriological determinations. Collect by "Bacti Pole" method. Keep sample iced (stations 1364, 202, 1536 only).

2. In addition to the above on Mondays only (Stations 1364, 202, 1536)

a) A 1 L. glass solvent rinsed bottle for PCB and mirex and pesticides analyses. Keep sample iced and in the dark.

b) A 6 oz. glass jar for mercury analysis. Preserve samples by adding 3 drops of conc nitric acid and enough potassium dichromate (a few drops) to maintain a pale purple colour. Check occasionally to ensure maintenance of colour.

c) A 500 ml. acid washed plastic bottle for metals analyses. Preserve sample by adding 10 drops nitric acid.

d) A 6 oz. glass phenol bottle with preservative for phenols analysis.

NOTE: Refer to "Outlines of Analytical Methods" for greater detail on sample bottle requirements and preservation techniques.

F. ONBOARD FILTRATION

Both total filtered phosphorus and chlorophyll samples must be filtered either in the field at the time of sampling or onshore (at MOE lab) immediately after sampling.

1. Chlorophyll Samples

Pass 500 ml (or as much as possible) of sample water through a 1.2 um millipore filter paper. Place the filter paper on an absorbent pad and put both into a petri dish. Label the petri dish lid with date, amount filtered and the sample number. Store chloro samples upright on ice and in the dark.

NOTE: Preserve sample with 10% $Mg\ CO_3$ solution at a rate of 1 ml per litre prior to filtering.

2. Total Filtered Phosphorus Samples

These are to be collected in special TFP sample tubes as follows:

a) Rinse the sample tube and the filter jar with distilled water.
b) Pass a few ml of sample water through the special sartorius filter (0.45 u) into the sample tube. Use this filtrate to rinse the tube and its cap. Discard filtrate.
c) Repeat step b.
d) Filter sufficient sample water to fill the TFP tube to just below the cap.

G. SAMPLE NUMBERS

Use sample number series 0 - 9000.

H. SUBMISSION SHEETS AND SAMPLE SUBMISSION

Samples taken to the laboratory must be accompanied by both deck sheets and Great Lakes submission sheets.

Complete these forms and submit the samples as follows:

1. The regular chemical samples (i.e. excluding PCB's and metal samples) collected every day are to be put into the cooler at sample reception except for the nutrient samples which are to be put into the freezer. Leave the submit sheets pertinent to these samples in the cooler.

2. Bacteriological samples are to be delivered directly to the bacti lab along with the deck sheets.

NOTE: Bacti samples do not require submit sheets.

3. The metals samples collected on Mondays are to be packaged separately along with a separate submission sheet. Label the box "Metal Samples" and put into the cooler.

4. Similarly the PCB samples collected on Mondays are also to be packaged separately along with a separate submission sheet. Label the box "PCB Samples" and put into the cooler.

I. SAMPLE BOTTLE AND SAMPLER RINSING PROCEDURES

To prevent possible contamination, samplers and sample bottles are to be rinsed as follows:

1. The water sampler (e.g. Kemmerer) is to be rinsed thoroughly with sample water before being used - particulary before the first sample collection of the day. To accomplish this, partially fill the sampler at the first station, agitate it thoroughly and discard water. Before subsequent samplings, drag the sampler through the water just before the boat has come to a complete stop.

2. All sample bottles except PCB, Metals and Bacti bottles (or any others that have been pre-treated or contain preservatives) are to be rinsed twice with sample water before being filled.

J. GENERAL FIELD PROCEDURES

1. Instructional Material

The following reference material should be readily available during any water quality survey.

a) "Deck Sheet Coding Manual".
b) "Outline of Analytical Methods" - provides a brief outline of the analytical methods used for commonly measured parameters, amount of sample water needed for analysis, preservation techniques, etc.
c) "Parameter Description Printout" provides the current parameter codes used in the Great Lakes computer system.
d) Operating manuals pertinent to meters or other pieces of equipment being used.
e) Water Deck Sheets, Sediment Deck Sheets, DO/temp cast records, Daily Operations Sheets, Great Lakes Submission Sheets.

2. Oil Slicks

Normal survey operations at a station should be suspended, should an oil slick or other unusual discharge be encountered. Where possible, tract the slick to its source and collect samples for possible prosecution. The procedures for sampling an oil slick should be at hand.

3. Parameter Codes

To facilitate EDP processing, enter the test codes for those parameters not pre-printed on the deck sheet in ascending code order.

4. A Daily Operations Report is to be completed everday.

5. Cautions

a) Since very low levels of certain constituents are being measured, great care must be exercised to avoid any contamination.

For example:

- Do not smoke or engage in any other activity which might introduce contamination while at the work bench.
- Keep the work area and lab equipment clean.
- Handle filter papers with metal forceps only. If they should be inadvertently touched with the fingers or blow off the filter holder, discard them.
- Keep the lid on packages of filter papers except when removing a filter.

b) Secure sample lables with an elastic band if they are to come in contact with moisture (i.e. ice) as the glue on the labels is water soluble.

c) Bacti bottles are sterile. Do not allow anything to come in contact with the bottle cap or neck after the cap has been removed except sample water.

d) Collect metals samples with an acrylic sampler. The Kemmerer sampler can be used for the remaining samples.